

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

Waste Utilization

(Number and Acre)

Code 633

DEFINITION

Using agricultural waste or other waste on land in an environmentally acceptable manner while maintaining or improving soil and plant resources.

PURPOSES

To safely use wastes to provide fertility for crop, forage, or fiber production; to improve or maintain soil structure; to prevent erosion; and to safeguard water resources.

CONDITIONS WHERE PRACTICE APPLIES

This practice is applicable on soils and vegetation suitable for the use of waste as a fertilizer. This includes wastes such as those from farm, feedlot, and dairy operations; municipal treatment plants; and agricultural processing plants.

CRITERIA

A. General Criteria

1. Waste application to land must comply with these specifications, state laws, or local ordinances, whichever is most restrictive.
2. The soil loss tolerance shall not be exceeded on soils receiving wastes.
3. Design of systems should take soil limitations into account.

B. Criteria for Animal and other Organic Agricultural Wastes.

1. Wastes will not be applied to frozen or snow-covered soil where slopes exceed 3%, except where wastes are injected or incorporated, or other provisions made to control runoff and pollution.
2. Wastes will not be spread in a waterway, terrace channel, or any area where there may be a concentration of water flow, except after construction where wastes are incorporated to aid in establishment of vegetation.
3. Wastes will not be applied to land closer than 200 feet to ponds, lakes, streams, wells, sinkholes, land subject to flooding or other areas where there is a probability of water pollution from runoff.
4. The amount of waste applied to the soil will be based on the nutrient requirements of the crop growing or to be grown and the nutrient holding capacity of the soil, and will not exceed 150 percent of the nitrogen needs of the crop to be grown. (see Table 1 for nutrients removed by crops.)
5. The application rate will be based on the procedures (detailed or simplified method) found in the Agricultural Waste Management Field Manual, Chapter 11, pages 11-15 to 11-17, and Chapter 17, pages 17-4 to 17-5.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

6. If using sprinkler irrigation to apply waste, consider applying clear water after waste is applied to wash off crops.

Table 1. Approximate Pounds of Plant Nutrients Removed by Crops

Crop	Unit	N	P ₂ O ₅	K ₂ O
		(pounds per unit)		
Corn, grain	bu	1.00	0.55	0.28
stover	cwt	0.87	0.38	2.40
silage	ton	7.50	3.10	9.40
Soybeans, grain	bu	4.20	1.10	2.40
stover	cwt	1.20	0.23	0.83
Wheat, grain	bu	1.80	0.55	0.34
straw	cwt	0.53	0.13	1.68
Rye, grain	bu	1.15	0.25	0.31
straw	cwt	1.05	0.44	1.49
Barley, grain	bu	1.10	0.40	0.35
straw	cwt	0.80	0.31	2.40
Oats, grain	bu	0.80	0.25	0.20
straw	cwt	1.10	0.47	3.90
Sorghum, grain	cwt	2.00	0.75	0.38
silage	ton	7.50	3.10	9.40
Sorghum-sudan	ton	40	15	59
Alfalfa	ton	56	10	60
Clover	ton	60	15	60
Bluegrass	ton	55	18	60
Bromegrass	ton	33	13	51
Orchardgrass	ton	50	17	63
Reed canarygrass	ton	55	13	50
Tall fescue	ton	39	19	53
Timothy	ton	38	14	63
Peas	ton	15	3	6
Beans	ton	17	5	19
Tomatoes	ton	3.60	1.68	7.20

C. Criteria for Municipal Sewage Sludge and Effluent.

1. Wastes will not be applied to frozen or snow-covered soil unless provisions are made to control runoff and pollution.
2. Wastes will not be spread in a waterway, terrace channel, or any areas where there may be a concentration of water flow.
3. Waste will not be applied to land adjacent to ponds, lakes, streams, wells, sinkholes, land subject to flooding, or other areas where there is a possibility of water pollution from runoff.
4. Determine the nutrient content of municipal sewage sludge and effluent to be applied, through laboratory analysis. The application will be based on Agricultural Waste Management Field Manual, Chapter 4.

5. Do not apply to land if, within 1 year, the land is to be used to produce root crops or vegetables that are consumed raw.
6. Do not graze dairy animals on treated pastures for 2 months after application.

Table 2. Maximum lifetime heavy metal addition to soils¹

Metal	Soil cation exchange capacity (meg/100g) ²					
	5		5 to 15		15	
	(lb/ac)	(kg/ha) ³	(lb/ac)	(kg/ha)	(lb/ac)	(kg/ha)
Zn	225	250	450	500	900	1000
Cu	110	125	225	250	450	500
Ni	45	50	90	100	180	200
Cd	4.5	5	9	10	18	20
Pb	450	500	900	1000	1800	2000

¹ Federal Register, Nov. 2, 1977, page 57425

² Determined before adding sludge to soil using the pH 7 ammonium acetate method for a weighted average to a depth of 20 inches (50 cm).

³ Kg/ha = lb./ac x 1.12

7. Determining application rates for sewage sludge and effluent.
- a. Quantity of municipal and industrial waste applied is dependent on the crop yield potential of the soil, the nitrogen, and heavy metal content of the waste material and the heavy metal composition of crops grown. Annual monitoring for N and heavy metals in crops, waste material and the soil is essential. Should tests reveal heavy metals in excess of suggested tolerance levels (Table 2 for soils and Table 6-2, Agricultural Waste Manual for crops) the waste should no longer be used.
- b. Maximum annual application rates of sludge and effluent on land should not exceed the following values:
- (1) Nitrogen requirements of the crop.
- (a) When incorporated—sludge should be applied at no more than 100% of the crop requirements for available (inorganic) N. It can be estimated that 20% of organic N becomes available as inorganic N in the year of application.
- (b) When surface applied—sludge should not exceed 150% of the crop requirement for available N.
- (2) On land used for the production of food-chain crops for human consumption such as leafy vegetables, root crops, or other crops in which the edible portion will contact the soil or sludge, the annual application of cadmium will not exceed 0.5 kg/ha (0.45 lbs./ac.) and such crops will not be grown for 18 months following application.
- (3) On land used for the production of food-chain crops, where the edible part does not come in contact with soil or sludge, such as wheat, corn, peas, and beans, the annual application will not exceed the following amounts:
- | | |
|------------------------|-------------------------------|
| Present to 6/3/1984 | 2.0 kg/ha (1.8 lb/ac) |
| 7/1/1984 to 12/31/1986 | 1.25 kg/ha (1.1 lb/ac) |
| After 1/1/1987 | 0.5 kg/ha (0.45 lb/ac) |
- c. Apply sludge only to soils with a pH 6.5 or greater, and are to be managed at pH 6.2 or greater after application.

- d. Sludge is not to be applied to soils with less than 20 inches (50 cm) of depth to bedrock or to other root restricting layers.

CONSIDERATIONS

According to EPA Interim Regulations, the application rates specified above may be exceeded if:

- a. The crop is to be used for animal consumption only.
- b. There is a facility operating plan to prevent consumption of the crop by humans.
- c. A stipulation is recorded in the property deed that the property has received high cadmium applications and food-chain crops should not be grown.

Public access should be controlled for 12 months on all areas receiving sludge unless sludge has been treated by a "Process to Further Reduce Pathogens."

Crop and livestock data should be obtained from the operator.

Agricultural and municipal wastes are valuable economic assets, which can be used to replace all or part of the plant nutrients used by crops.

Based on the results of soil tests and the quantity of nutrients applied in wastes, additional nutrients should be applied in the form of chemical fertilizers to assure a proper balance of available nutrients for the crop to be grown.

Excess applications of wastes can create nuisances, harm crops and soils, and reduce the quality of ground and surface water.

Odors from improperly applied wastes can interfere with the enjoyment of life and property for people living in the area. Consideration should be given to separation distances, wind direction and the use of soil injection-type applicators when applying wastes.

Soil properties such as permeability, degree of slope, wetness, runoff, flooding hazard, available moisture holding capacity and infiltration rates must be accounted for where wastes are applied.

For protection from aerosol drift, consider the use of tree shields and/or clear distances when utilizing wastes from municipal treatment plants.

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff, and infiltration.
2. Variability of the practice's effects caused by seasonal weather variations.
3. Effects of increasing organic matter on water holding capacity of the soil.
4. Potential for a change in plant growth and transpiration because of changes in the volume of soil water.

Water Quality

1. Effects on the movement of soluble and sediment-attached substances, sediment, organic material, and pathogens that could be carried by runoff.
2. Effects on the use and management of nutrients and pesticides and resulting effects on surface and ground water quality.

PLANS AND SPECIFICATIONS

Plans and specifications will be developed for specific field sites based on this practice standard.

OPERATION AND MAINTENANCE

An operation and maintenance plan will be developed in keeping with this practice standard.